

## ABSTRACT OF THE DISCLOSURE

Synthetic polymer complements (SPCs) are provided, as well as methods for their synthesis and use. The SPCs may have surfaces that include functional groups that are complementary to surface sites of targets such as nanostructures or  
5 macromolecular targets, and may be capable of specifically interacting with such targets. The positions of the functional groups in one embodiment are stabilized by a polymer network. The SPCs are formed by contacting the target with a set of monomers which self-assemble on the target, and then are polymerized into a network to form the synthetic polymer complement. At least a portion of the surface  
10 of the resulting SPC thus may include an imprint of the target. The complex of the SPC and the target may be the desired product. Alternatively, the target is released, for example, by controllably expanding and contracting the crosslinked network. The SPC is isolated and used in many applications.